Research Summary


Development of a Geotechnical Asset Management Collection and Rating Program

This research project developed a geotechnical asset management (GAM) rating program for MoDOT. The GAM program compiles condition and risk assessment for six geotechnical asset types: engineered embankments, retaining walls, rock slopes, soil slopes, subsidence features, and subgrades. Assessments include determination of asset condition and a relative risk assessment.

The methodology for assessing the six geotechnical asset types draws heavily on previously published rating methods, adjusted and expanded where necessary to describe conditions in Missouri. This allows MoDOT to combine their GAM data with that collected by other agencies and develop other components of a mature GAM Program while MoDOT is still in the early stages of inventory and assessment.

For each of the geotechnical asset types, the data collected is split into two groups: general information and detailed rating categories. The general information collects background information on the asset type, location, and any previous work performed. The detailed rating categories collected information directly related to the hazard associated with a given asset and the consequence of failure. Hazard categories described the condition of the slope and are quantitatively associated with event likelihood.
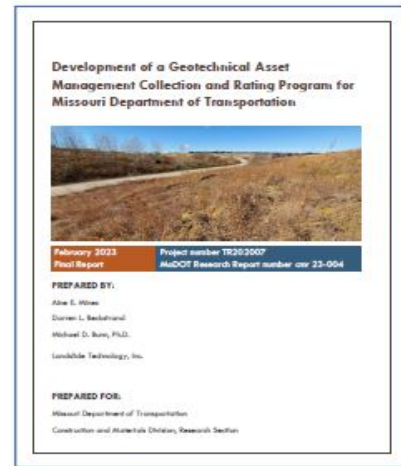
Consequence categories incorporated roadway usage and geometry and are qualitatively associated with the impact of failure on the travelling public. As recommended for asset management programs, detailed rating categories are scored from 0 to 100, with 100 being the best score, and 0 the worst.

Using subsets of the detailed rating categories for each asset, the research team calculated and assigned both an asset condition and level of risk to each inventoried asset. Asset condition is expressed in a variety of methods, including numerically and with 'Good'/'Fair'/'Poor' descriptors that have broader appeal. Numerical asset scores range from 0 to 100, with 0 being the worst and 100 being the best.

> *"The GAM program compiles condition and risk assessment for six geotechnical asset types: engineered embankments, retaining walls, rock slopes, soil slopes, subsidence features, and subgrades."*

Likewise, the research team used other detailed rating categories to calculate an approximate Level of Risk for each asset. This level of risk is qualitative, because long-term data on the frequency and impact of asset failures is not currently available. It is a combination of asset condition and relative consequence. Like asset condition, Level of Risk is scored from 0 to 100,

with 0 being the highest risk sites and 100 being the lowest risk. Numerical scores are also mapped to 'Low'/'Moderate'/'High' descriptors that are easily communicated and understood.

Using an ESRI program, Survey123, the research team developed a mobile application that runs both on mobile devices and on desktop computers. This application supports inventory and assessment work in both field and office environments. The inventory process is designed to be completed by an experienced engineering geologist or geotechnical engineer during a 20-minute site visit. Data collected within the ESRI environment is subsequently transferred to MoDOT's TMS space and incorporated into the department's existing data.
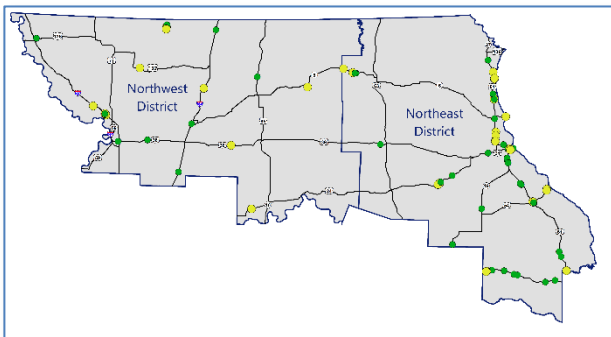
Figure 1: Map of geotechnical assets along NHS routes inventoried during field testing.

Field testing took place on National Highway System (NHS) routes in the Northwest and Northeast Districts in October 2022. A total of 91 geotechnical assets were inventoried. A map of the location and condition of assets inventoried during the field program is presented in Figure 1.

MoDOT plans to expand the program statewide now that the research project has been completed. These statewide inventory and condition assessments, proven viable within this research program, will allow MoDOT to reap the benefits and operational cost savings of proactive management of the department's geotechnical assets.

Project Information

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